



SAVANNAH RIVER SITE

321-M Fuel Fabrication Facility Technology Post-Demonstration Fact Sheet October 15, 1999

SIZE REDUCTION MACHINE

The Need

The 321-M Fuel Fabrication Facility was used to manufacture fuel elements for the site reactors for over 35 years. As a result of these activities, a significant number of areas and components were contaminated with uranium. Part of the deactivation project is to remove contaminated components in order to reduce contamination levels in these areas. To reduce waste disposal volumes, many of the larger pieces will need to be cut to improve disposal packaging. Conventional hand-held shears and portable saws subject the operators to early fatigue and possible accidents due to strain.

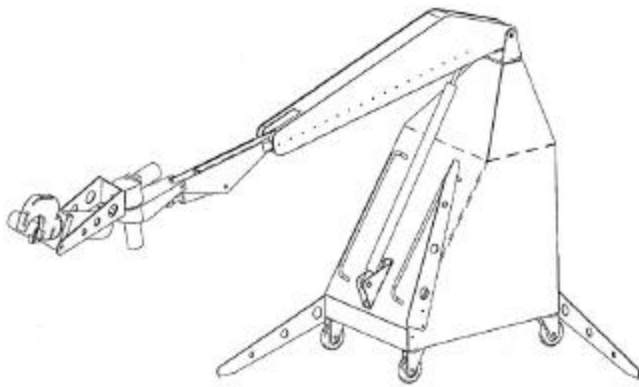


Figure 1. Isometric of Size Reduction Machine

Innovative Technology Description

The technology selected was a Size Reduction Machine (SRM) manufactured by Utility Engineering in partnership with Special Application Robotics. (Figure 1.) This equipment provided a non-robotic, manually moved machine that mounted a Champion hydraulic shear marketed by Mega-Tech Services, Inc. The machine is a mechanical assist device that takes the weight of the shear off the operator.

The counterweighted platform was moved and roughly aligned manually. The machine hydraulics and controls are mounted in the base unit, which controls the six axes of movement and the shear head cutter. A 20' tethered control panel controls all functions of the machine. The tether allows the control panel to be strategically placed for maximum visibility to the location being cut.

The machine is capable of shearing items from 1 foot below to 16-18 feet above floor level, and is capable of cutting within 4 inches of a wall or floor surface. Cutting in the overhead required only the use of a ladder to install rigging to lower the cut items. The shear has the capacity to cut stainless steel 3"x 3" angles; 4" schedule 40 pipes, and 4" x 3/8" channel. The dual hydraulic power pack uses standard 220/230 voltage single-phase power. A gripper device on the side of the shear head clamps the component being cut, centers and hold it square with the shear head. This also assists in keeping the cut item from falling. The machine fits through a standard 36" doorway and can be moved by two operators on a smooth level surface.

Baseline Technology

The baseline technologies that were used for comparison were a gasoline powered hydraulic ResQ hand held shear and standard hand held portable band saw using 100/120 voltage power.

Demonstration Description

The SRM was demonstrated and compared to the performance of the baseline technologies. Identical cuts were made by each method on loose and overhead items. The loose items ranged from light chairs to rolling carts made of stainless steel channel and angle (Figure 2). The overhead items ranged from 3"x 3" carbon steel angle to 1 1/2" carbon steel schedule 40 pipe.

The objectives of the demonstration were to show that the Size Reduction Machine

- increases production rates
- decreases costs associated with the size reduction of overhead items
- is safer to use (less chance of accident)
- is less fatiguing to the operator



Figure 2. Items To Be Size Reduced

Demonstration Summary

Items to be cut were first identified in the potentially contaminated overhead area of the 321-M building (Figure 3.). These included a plant and instrument air system with 1 ½" carbon steel piping, ¾" condensate piping, and an overhead lift rack consisting of 3" x 3" angle, support rods, and a unistrut trolley /rail system. Seventy-one cuts were made with each cutting method. The baseline technologies utilized a motorized scissors lift to access the cut location and move between cuts.

Using this lift greatly reduced the set-up time since the operators did not have to leave the lift to move between cuts. In addition they were able to hold the items being cut in lieu of rigging, and then lower the cut items directly by hand to the ground for disposal. Despite these two advantages, the Size Reduction Machine came out only marginally slower in overall unit cut time then the baseline methods. However there are other benefits attributed to the SRM. The SRM operators were less fatigued then the operators deploying the baseline methods since the lifting of the cutting tool overhead was eliminated. In addition, the SRM removed the operators from harm's way, by providing a standoff capability and thus reduced the potential for injury. Movement of the SRM however, is manual, and inherently has some injury potential in this step of the cutting.



Figure 3. Size Reduction Machine In Overhead Position

The cutting of loose items took place in the High Contamination Area (HCA) of the 321-M building. To help with decontamination at the end of the demo, the SRM was covered with poly except for the shear head and HEPA filter on the cooling fan inlet and exit filters. The operator running the machine control panel was dressed in one pair of protective clothing. The other operator kept the SRM supplied with items to be size reduced. This operator was located in an Airborne Contamination Area and was dressed in two pair of protective clothing and full-face respirator.

The loose items consisted of standard and rolling chairs and stainless steel carts. The SRM outperformed the baseline methods in the chair size reduction and performed as well as the portable band saw when cutting the stainless steel carts. (The hand held shear could not make the larger cuts in the stainless steel components and therefore could not be used for direct comparison.). Again the SRM operators benefited from not having to handle the cutting tool and not being in the immediate vicinity of the cut. The operator(s) at the shear end of the SRM

only had to handle the material being cut and not the cutting tool itself. On the baseline technologies, the operators had difficulty operating the trigger switches on the hand held tools since they were required to wear two pair of gloves. The control panel for the SRM has 3 large joysticks and oversized push buttons that allow it to be operated with gloves. The SRM was successfully decontaminated upon completion of the demonstration to free release including the shear head.

Benefits of the Size Reduction Machine

- Similar speed in cuts/ hour to the baseline
- Less fatiguing to operators
- Safer, removes operators from harm's way
- Cuts larger items faster
- Easier to use when dressed out in protective clothing

Future Applicability

The SRM can be used wherever size reduction or removal of components is required. It should not be considered a stand-alone cutting device and should be used in conjunction with a baseline tool to get the most flexibility and production from it. It would be especially useful in overhead pipe and component removal jobs where safety of the operators is important. It could be very useful in the reduction of components in a radiological area since it is easy for an operator with two pair of gloves to control. Access to small areas through standard doorways does not present a problem.

Contact Persons

Marley Bruns, WSRC, (803) 725-1373; email: marley.bruns@srs.gov

Jeff Lee, WSRC, (803) 725-0652; email: JEFFREYW.LEE@srs.gov

Cecil May, WSRC, (803) 725-5813; email: CECIL.MAY@srs.gov

John Duda, FETC, (304) 285-4217; email: jduda@fetc.doe.gov

Martin Salazar, DOE-SR, (803) 557-3617; email: MARTIN.SALAZAR@srs.gov

Dan Johnson, Utility Engineering and /Special Application Robotics, (970) 663-1431; email: SARobot@aol.com